

**LISTING OF CLAIMS**

1. **(Original)** A process for the enhanced production of pantothenate, comprising culturing a microorganism having a deregulated methylenetetrahydrofolate (MTF) biosynthetic pathway, under conditions such that pantothenate production is enhanced.
2. **(Original)** A process for the enhanced production of pantothenate, comprising culturing a microorganism having
  - (i) a deregulated pantothenate biosynthetic pathway, and
  - (ii) a deregulated methylenetetrahydrofolate (MTF) biosynthetic pathway, under conditions such that pantothenate production is enhanced.
3. **(Original)** The process of claim 2, wherein said microorganism has at least two pantothenate biosynthetic enzymes deregulated.
4. **(Original)** The process of claim 2, wherein said microorganism has at least three pantothenate biosynthetic enzymes deregulated.
5. **(Original)** The process of claim 2, wherein said microorganism has at least four pantothenate biosynthetic enzymes deregulated.
6. **(Original)** The process of claim 5, wherein said microorganism has a deregulated ketopantoate hydroxymethyltransferase, a deregualted ketopantoate reductase, a deregulated pantothenate synthetase and a deregulated aspartate- $\alpha$ -decarboxylase.
7. **(Previously Presented)** The process of claim 1 or 2, wherein said microorganism further has a deregulated isoleucine-valine (*ilv*) biosynthetic pathway.
8. **(Original)** The process of claim 7, wherein said microorganism has at least two isoleucine-valine (*ilv*) biosynthetic enzymes deregulated.
9. **(Original)** The process of claim 7, wherein said microorganism has at least three isoleucine-valine (*ilv*) biosynthetic enzymes deregulated.

10. **(Original)** The process of claim 9, wherein said microorganism has a deregulated acetohydroxyacid acid synthetase, a deregulated acetohydroxyacid isomeroreductase, and a deregulated dihydroxyacid dehydratase.

11. **(Original)** The process of any one of claims 1 to 10, wherein the microorganism has at least one MTF biosynthetic enzyme deregulated.

12. **(Original)** The process of claim 11, wherein the microorganism has a deregulated *glyA* gene.

13. **(Original)** The process of claim 11, wherein the microorganism has a deregulated *serA* gene.

14. **(Original)** The process of claim 11, wherein the microorganism has a deregulated *glyA* gene and a deregulated *serA* gene.

15. **(Original)** The process of claim 12 or 14, wherein the microorganism has a mutated, deleted or disrupted *purR* gene.

16. **(Original)** A process for the enhanced production pantothenate, comprising culturing a microorganism having a deregualted pantothenate biosynthetic pathway, a deregulated isoleucine-valine (*ilv*) biosynthetic pathway, and a deregulated methylenetetrahydrofolate (MTF) biosynthetic pathway deregulated, such that production of pantothenate is enhanced.

17. **(Original)** A process for the production pantothenate, comprising culturing a microorganism having a deregulated pantothenate biosynthetic pathway, a deregulated isoleucine-valine (*ilv*) biosynthetic pathway, and a deregulated methylenetetrahydrofolate (MTF) biosynthetic pathway, such that at least 50 g/L pantothenate is produced after 36 hours of culturing the microorganism.

18. **(Original)** The process of claim 17, comprising culturing the microorganism such that at least 60 g/L pantothenate is produced after 36 hours of culturing the microorganism.

19. **(Original)** The process of claim 17, comprising culturing the microorganism such that at least 70 g/L pantothenate is produced after 36 hours of culturing the microorganism.

20. **(Original)** A process for the production pantothenate, comprising culturing a microorganism having a deregulated pantothenate biosynthetic pathway, a deregulated isoleucine-valine (*ilv*) biosynthetic pathway, and a deregulated methylenetetrahydrofolate (MTF) biosynthetic pathway deregulated, such that at least 60 g/L pantothenate is produced after 48 hours of culturing the microorganism.

21. **(Original)** The process of claim 20, comprising culturing the microorganism such that at least 70 g/L pantothenate is produced after 48 hours of culturing the microorganism.

22. **(Original)** The process of claim 20, comprising culturing the microorganism such that at least 80 g/L pantothenate is produced after 48 hours of culturing the microorganism.

23. **(Original)** The process of any one of the preceding claims, wherein pantothenate production is further enhanced by regulating pantothenate kinase activity.

24. **(Original)** The process of claim 23, wherein pantothenate kinase activity is decreased.

25. **(Original)** The process of claim 24, wherein CoaA is deleted and CoaX is downregulated.

26. **(Original)** The process of claim 24, wherein CoaX is deleted and CoaA is downregulated.

27. **(Original)** The process of claim 24, wherein CoaX and CoaA are downregulated.

28. **(Original)** The process of any one of the above claims, wherein said microorganism is cultured under conditions of excess serine.

29. **(Original)** A process for producing pantothenate comprising culturing a microorganism having a deregulated pantothenate biosynthetic pathway under conditions of excess serine, such that pantothenate is produced.

30. **(Original)** The process of any one of the above claims, wherein said microorganism has the pantothenate biosynthetic pathway deregulated such that pantothenate production is independent of  $\beta$ -alanine feed.

31. **(Original)** The process of any one of the above claims wherein the microorganism is a Gram positive microorganism.

32. **(Original)** The process of any one of the above claims wherein the microorganism belongs to the genus *Bacillus*.

33. **(Original)** The process of any one of the above claims, wherein the microorganism is *Bacillus subtilis*.

34. **(Original)** A product synthesized according to the process of any one of the above claims.

35. **(Original)** A composition comprising pantothenate produced according to the process of any one of the above claims.

36. **(Original)** A recombinant microorganism for the enhanced production of pantothenate, said microorganism having a deregulated pantothenate biosynthetic pathway, and a deregulated methylenetetrahydrofolate (MTF) biosynthetic pathway.

37. **(Original)** A recombinant microorganism for the enhanced production of pantothenate, said microorganism having a deregulated pantothenate biosynthetic pathway, a deregulated methylenetetrahydrofolate (MTF) biosynthetic pathway, and a deregulated isoleucine-valine (*ilv*) pathway.

38. **(Original)** The microorganism of claim 36 or 37, further having reduced pantothenate kinase activity.

39. **(Original)** The microorganism of any one of claims 36-38 which is a Gram positive microorganism.

40. **(Original)** The microorganism of any one of claims 36-38 belonging to the genus *Bacillus*.

41. **(Original)** The microorganism of any one of claims 36-38 which is *Bacillus subtilis*.

42. **(Original)** A process for producing pantothenate comprising culturing a recombinant microorganism having:

- (a) a deregulated *panB* gene;
- (b) a deregulated *panD* gene; and
- (c) at least one deregulated isoleucine-valine (*ilv*) biosynthetic enzyme-encoding gene;

under conditions such that at least 30 g/l pantothenate is produced after 36 hours of culturing the microorganism.

43. **(Original)** The process of claim 42, wherein said microorganism further has a deregulated methylenetetrahydrofolate (MTF) biosynthetic pathway and said microorganism is cultured under conditions such that at least 50 g/l pantothenate is produced after 36 hours of culturing the microorganism.

44. **(Original)** A process for producing pantothenate comprising culturing a recombinant microorganism having:

- (a) a deregulated *panB* gene; and
- (b) a deregulated *panD* gene;

under conditions of excess serine, such that at least 50 g/l pantothenate is produced after 36 hours of culturing the microorganism.

45. **(Original)** A process for producing pantothenate comprising culturing a recombinant microorganism having:

- (a) a deregulated *panB* gene;
- (b) a deregulated *panD* gene; and
- (c) a deregulated methylenetetrahydrofolate (MTF) biosynthetic pathway;

under conditions of excess valine, such that at least 50 g/l pantothenate is produced after 36 hours of culturing the microorganism.

46. **(Original)** A process for producing pantothenate comprising culturing a recombinant microorganism having:

- (a) a deregulated *panB* gene;

- (b) a deregulated *panD* gene; and
- (c) a deregulated *glyA* gene;

under conditions of excess valine, such that at least 50 g/l pantothenate is produced after 36 hours of culturing the microorganism.

47. **(Original)** A process for producing pantothenate comprising culturing a recombinant microorganism having:

- (a) a deregulated *panB* gene;
- (b) a deregulated *panD* gene; and
- (c) a mutated, deleted or disrupted *purR* gene;

under conditions of excess valine, such that at least 50 g/l pantothenate is produced after 36 hours of culturing the microorganism.

48. **(Original)** A process for producing pantothenate comprising culturing a recombinant microorganism having:

- (a) a deregulated *panB* gene;
- (b) a deregulated *panD* gene; and
- (c) a deregulated *serA* gene;

under conditions of excess valine, such that at least 50 g/l pantothenate is produced after 36 hours of culturing the microorganism.

49. **(Original)** A process for producing pantothenate comprising culturing a recombinant microorganism having:

- (a) a deregulated *panB* gene;
- (b) a deregulated *panD* gene;
- (c) a deregulated *serA* gene;
- (d) a deregulated *glyA* gene; and

under conditions of excess valine, such that at least 50 g/l pantothenate is produced after 36 hours of culturing the microorganism.